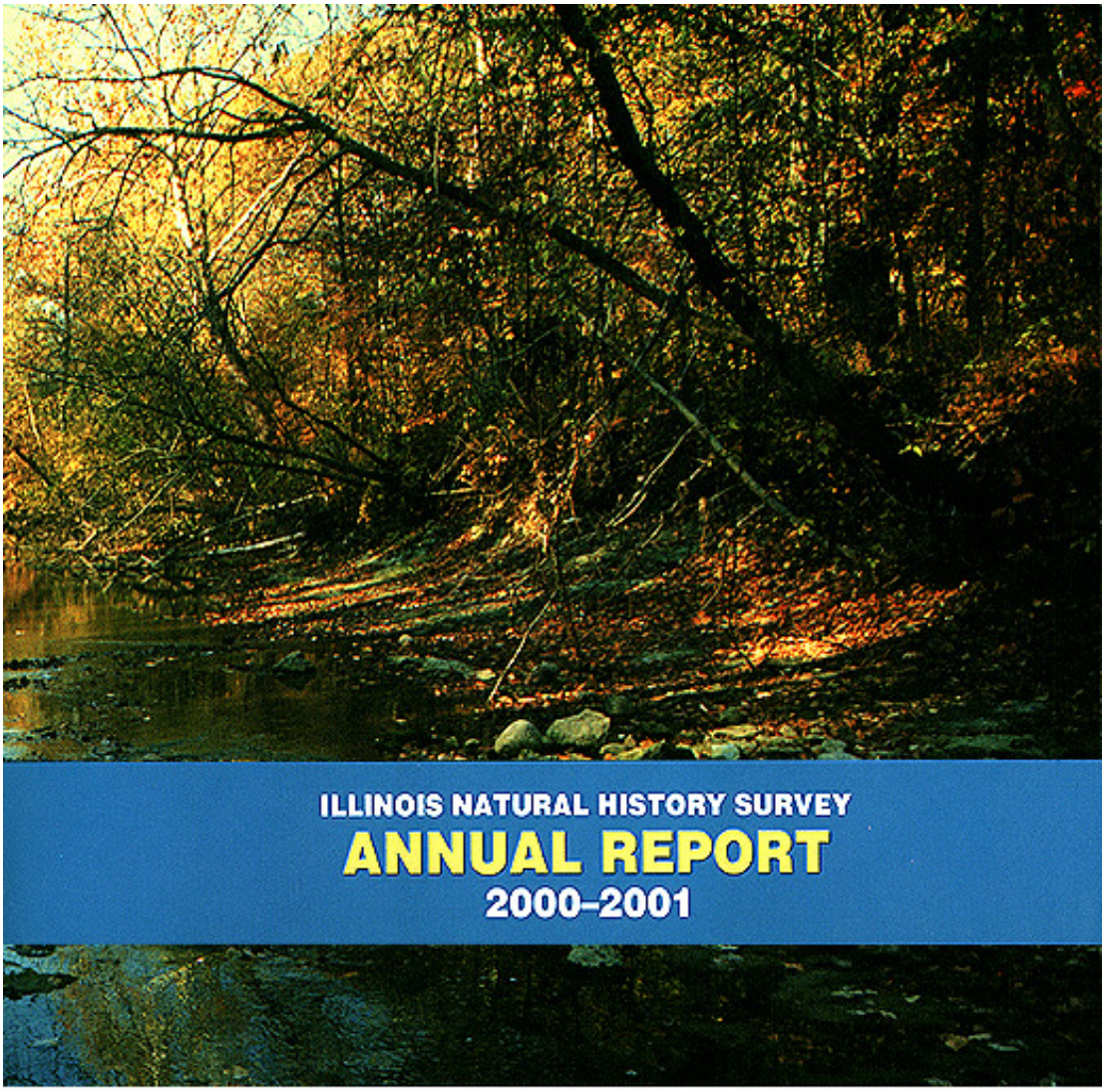
Illinois Natural History Survey Annual Report 2000-2001



David L. Thomas, Chief-Illinois Natural History Survey,
A Division of the Illinois Department of Natural Resources-Brent Manning, Director

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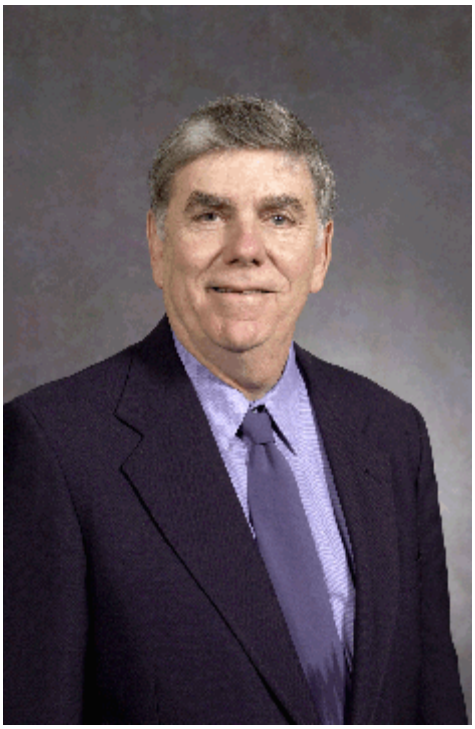
Message from Chief David L. Thomas



I am pleased to present our Annual Report for FY 2001 (July 2000 through June 2001). We continue to look for ways of communicating what we are doing in a concise and interesting way. While our discussions of various topics are brief, we have provided more extensive lists of projects and publications, and would urge you to follow up with our Centers if we can provide more details about any particular topic of interest. We have provided in this year's report a more detailed description of some of our activities related to the Critical Trends Assessment Program (CTAP). This statewide monitoring program is allowing us to begin determining the status of our forests, grasslands, wetlands, and streams through the efforts of professional biologists and citizen volunteers. We are also collecting data on invasive species in each of these habitats.

One of the topics addressed in this report focuses on our work with the massassauga rattlesnake near Lake Carlyle. We are learning a great deal about this state threatened and endangered species by the use of radio tags to document its movements and other aspects of its life history. This species is also interesting in that protecting it reflects some of the conflicts we are facing as a society: our desire to develop land for commerce and recreation versus our desire to protect some of our natural resources. Only through a detailed understanding of the ecology of various species and habitats can we make sound recommendations that will protect rare species and unique habitats while still allowing development to take place in an environmentally friendly fashion.

Our work on invasive species continues and has expanded as we address additional species that have created problems for our state. The soybean aphid was identified last summer by one of our entomologists, Dr. David Voegtlin. This aphid, a native of China and Japan, attacks soybean plants and caused some farmers to spray their soybeans this past summer. It overwinters on buckthorn, an invasive plant in Illinois that has also become problematic. Monitoring its spread and population size will provide critical information to our agricultural community.

We kicked off a monitoring effort this year to look for West Nile virus by checking dead birds and mammals that occur in areas where we suspected the virus could first show up in Illinois. In the late summer and fall of 2001, a number of crows infected with the virus were found in Illinois.

An aquatic species of concern is the round goby, and staff at the Survey participated in a round goby roundup, sponsored by the Fish and Wildlife Service, to look at the distribution of gobies in the Chicago waterways and upper Illinois River system. An electric barrier is being established near Romeoville to keep the goby out of the Illinois River, but some gobies have already been found below the barrier. Monitoring of this species will need to continue. In addition, coming up the river are the invasive bighead and silver carp. Large numbers of young fish were found in the LaGrange reach of the Illinois River and at Lake Chatauqua during summer 2000 and again this year. Determining the impact on the

river's ecology of these invasive carp will be an important activity of INHS aquatic scientists, as will the determination of its continued spread upriver.

The INHS received a contract this last year from the Illinois Department of Natural Resources (IDNR) to coordinate and carry out the state's Aquatic Nuisance Species plan. Federal funding is supporting this effort with money coming yearly from the Fish and Wildlife Service. Evaluating the effectiveness of the fish barrier near Romeoville and identifying additional measures to prevent the transfer of invasive species between Lake Michigan and the Illinois River will be an important priority of the Invasive Species Coordinator.

Studies of the Illinois River watershed remain a priority of the Survey. With the Illinois River 2020 initiative receiving federal authorization under the Water Resources Development Act, there will be even greater activities within the watershed to undertake restoration projects. Pulling together in an accessible fashion the diverse databases on the Illinois River is one of the objectives of the Illinois River Decision Support System, a Web-based decision support system being managed by the Illinois State Water Survey. The INHS is involved in this project and has hired a database manager to begin putting relevant biological databases on the system. CTAP data are the first priority as described later in this annual report.

Headquarters of the Illinois Natural History Survey in Champaign.

Our work on the biological control of purple loosestrife in northern Illinois is ongoing and we continue to have successes at a number of wetlands where beetles that feed on loosestrife

were released in the past. Success is mixed and has been most dramatic where there has been a large monoculture of purple loosestrife. We are documenting not only the recovery of native vegetation in wetlands undergoing loosestrife control but also the use of loosestrife and native vegetation by wetland birds.

Administratively we made a number of changes during the last year. Under the direction of our new Assistant Chief, Dr. Ron McGinley, we undertook an evaluation of the Office of the Chief and made some organizational changes to help us increase efficiency and provide better services to the public. Our network office and educational and outreach activities were brought under the supervision of Dr. McGinley. All facilities-related issues, including our shops and greenhouses, were put under the direction of Dr. William Ruesink, Assistant Chief for Planning.

Facility planning activities remain a priority for the Survey. Space for scientists and support staff are cramped and getting more so each year. While the availability of the Nurses Annex at Burnham Hospital in Champaign has alleviated some of the more severe crowding, this facility is up for sale, and likely will be sold in late 2001. To accommodate staff and storage at Burnham, plus other immediate space needs, INHS and the Illinois State Geological Survey submitted a request to the State for rental space in the new research park on the south campus of the University of Illinois in Champaign. Money for the rental was forthcoming in the FY02 budget and we anticipate moving staff into the new space by February 2002. The adjacency of this space to our Natural Resources Annex will facilitate better use of both facilities. In addition, at the end of the 2001 fiscal year we initiated a planning exercise with the UIUC to look at a "Survey" campus on the lands west of the south research park (lands that include our present Natural Resources Study Annex plus the Waste Management and Research Center). This planning will incorporate the already-developed plans for a Natural History Research Center facility, which was initially planned to be located on the UIUC campus on land managed by the College of Agricultural, Consumer and Environmental Sciences.

Regarding facilities, we were fortunate this last year to receive funds that can help us upgrade some of our field stations. In particular, projects are scheduled at the Kaskaskia Biological Station and the Forbes Biological Station. The latter will involve an addition that will provide new laboratory space. Also over the last year we upgraded the network access of a number of field stations, a particularly important step to bring better communications with our more remote locations.

Our budgets remain strong and we are still benefitting from initiatives a few years ago to provide more funds for vehicles and scientific equipment. This is allowing us to replace some very old and unsafe vehicles and provide much-needed equipment to our staff. Our facilities and administration (F&A) fund (based on the return of indirect funds from contracts through the UIUC) continues to grow stronger and will allow us to provide greater support to our researchers. This increase in our F&A funds is a sign of how successful our scientists have been in securing outside funding to expand their research programs.

Lastly, we continue to look for ways of providing outreach and education on important topics related to the biological sciences. The Biodiversity Blitz that we performed at Allerton Park at the end of June 2001 is an example of a cross-Survey activity that highlighted not only some of what we do at the Survey but the nature and value of biodiversity in our own back yard. Approximately 200 scientists from the Survey, University of Illinois, IDNR, and elsewhere participated in this effort to identify as many taxa as possible

of all living organisms within a 24-hour period. While a final tally is not yet in hand, we estimate that over 2,000 separate plants and animals were identified in this period of time. In addition, the public was treated to lectures by various scientists as well as having the opportunity to join scientists in the field. A similar event is now being planned by the City of Chicago, in conjunction with Survey personnel, for the Calumet area. These types of educational events raise the public's awareness of the diversity of life around us. The success of the coalition of over 130 groups in the Chicago region that are part of Chicago Wilderness, whose mission is to promote biodiversity of the region, attests to the fact that the public does have a growing appreciation of our natural resources.

I hope that you enjoy this year's annual report and that you will provide us with your comments on our work. I would also urge you to visit our Web site to learn more about our research and other activities. In a state and world with expanding populations, the information we generate on natural resources becomes ever more critical to decision makers. We will continue to look for ways of better addressing the pressing biological issues of our time.

Public Services

Education and Outreach

By Michael Jeffords

INHS volunteers sort specimens during Biodiversity Blitz.

If the education/outreach effort were to be categorized for FY2001, the overall theme would be big events and ongoing educational programs. The major events include

- Insect Expo in southern Illinois that drew an estimated 3,000 children from three states. The event was held in conjunction with the Cypress Creek National Wildlife Refuge and Cache River State Natural Area.
- a symposium on Biodiversity in Illinois and Beyond featured at the Environmental Horizons Conference, sponsored by the UI Environmental Council. Six Survey speakers covered a variety of topics.

- a Biodiversity Blitz at Robert Allerton Park, Monticello, where 160+ scientists found and named as many species as possible within a 24-hour period. Some 2,000 species were identified. In addition, a series of programs and excursions was offered at the event.
- several Illinois Wilds Institute for Nature (IWIN) classes were offered, including two drawing classes and a class on the butterflies of Illinois. All were well received.

In addition, the Survey produced several new educational posters, highlighted by two new full-color Illinois habitat posters on the Bog and the Sand Prairie. A new coloring poster showing the organisms that inhabit the soil was also produced.

In conjunction with the exotic species program, the Survey produced a 2001 calendar of exotic species. This featured photos of 12 exotic, invasive species and information about them. The calendar also has significant events for each month related to the topic. The calendar was very popular and distributed statewide and regionally.

Exotic species was also the focus of a full-color poster on the gypsy moth as well as educational displays centered around the Asian longhorned beetle. In this same vein, the purple loosestrife education program continued with three workshops conducted during the year that trained 75 teachers in the concepts of biodiversity, wetlands, and the management of purple loosestrife with *Gallerucella*beetles.

New opportunities continue to arise and the education/outreach program is constantly looking for new avenues to acquaint Illinois citizens with the rich diversity of life that inhabits Illinois.

Kate Higgs helps students learn about insects during an INHS outreach event.

OFFICE OF EDUCATION OUTREACH ACTIVITIES FOR FY 2001

1. Numbers of the following types of publications

Technical Reports --2

Miscellaneous --8 popular

2. Numbers of the following outreach activities

- Queries answered --110
- Species identified --50
- Boards and committees served--11
- Public presentations
    - schools, K-12--17
    - colleges --7
    - conferences and symposia, etc.--16
    - clubs and private organizations --6
    - state and federal agencies --2

EDUCATION OUTREACH ACTIVITIES OF ENTIRE SURVEY FOR FY 2001

1. Numbers of the following types of publications

- Scientific--114
- Technical Reports--155
- Miscellaneous--77

2. Numbers of the following outreach activities

- Queries answered--2,976
- Species identified--8,541
- Boards and committees served--119
- Public presentations
    - schools, K-12--153
    - colleges--129
    - conferences and symposia, etc.--248
    - clubs and private organizations --92
    - state and federal agencies --86
    - international meetings --40

Collections

By Lawrence M. Page

Several scientific disciplines rely on collections of biological organisms. Systematics, the study of the diversity of life--in particular, the study of evolutionary relationships and determination of appropriate names to be applied to populations--traditionally has been the primary interest of scientists working with collections. At the Survey, data extracted from collections, especially data on spatial variation in populations, have been used by systematists to determine which species are found in Illinois. This information is used directly or indirectly by every resident of Illinois, whether it be someone interested in controlling pests, or protecting rare species, or using wildlife for recreational purposes such as nature photography, hunting, and fishing.

Scientists other than systematists, particularly ecologists and conservation biologists, increasingly are turning to collections to understand the temporal changes taking place in the state's biological communities. Changes in species distribution and abundance, including the loss of native species and invasions of exotic species, are of general concern to most people and often are best documented and most easily explained by databases built from collection-oriented research. Data associated with the biological collections of the Illinois Natural History Survey effectively provide the public with information about changes that are taking place in the Illinois environment.

With continued modification of natural habitats, the value of collections to society will increase. For many areas, the only records of a species' presence will be the specimens in institutional collections. Fortunately, the Survey has collections that are among the largest and most valuable of any state-supported institution. These collections provide valuable information to decision makers and other citizens of Illinois concerned with protecting the environment. Much of the information used by the Illinois Department of Natural Resources to recognize endangered and threatened species, to identify outstanding natural areas, and to develop management programs comes from data associated with the Survey's collections.

COLLECTION	NO. SPECIMENS	NO. VISITORS	NO. LOANS	LOANED	REQUESTS	NO. SCIENTIFIC PUBLICATIONS CITING INHS SPECIMENS	NO. SPECIMENS ADDED
Amphibians & Reptiles	114,662	19	16	199	23	15	1,477
Annelids	310,000	4	0	0	5	3	1,414
Crustaceans	98,994	5	3	283	18	0	6,653
Fishes	773,070	77	21	1,351	23	8	23,116
Insects	6,500,000	188	48	31,242	18	4	21,481
Mammals	61,789	2	3	72	12	1	0
Mollusks	105,382	12	3	7	25	5	1,019
Plants	261,780	14	6	97	13	3	3,702

The Survey's collections are heavily used by Survey scientists, scientists at other institutions, educators, and members of the general public. They are used in studies leading to reports on the Illinois environment, in scientific publications, and in exhibits. Visitors to the collections in the past year included students from several elementary schools, students and faculty from colleges and universities, scientists from museums, and staff of environmental organizations and governmental agencies. Loans of specimens and collection-associated data went to about 50 colleges, universities, and museums, to several other public and private institutions in Illinois, and to scientists in several foreign countries.

Library

By Elizabeth Wohlgemuth

The Natural History Survey Library serves a wide range of library users. As a state agency library it strives to meet the diverse research needs of the Survey scientists and staff members; as a departmental library at the University of Illinois at Urbana-Champaign, students, faculty, and staff are frequent users of the library. The public is also welcome.

The library has approximately 650 current journal subscriptions and more than 40,000 books and bound journals. Many of these journal subscriptions are received through our exchange program, which includes 405 exchange partners throughout the world sharing their publications with the Survey. Our full text journal database presently offers access to almost 300 full text, on-line journals. The majority of the library's $65,424 budget is applied to journal subscriptions and electronic article databases. *Zoological Record*, *Fisheries Worldwide*, *Wildlife Worldwide*, *Current Contents*, and *Biosis* are just a few of the many electronic article databases available. The INHS library holdings are part of the UIUC's online catalog and can be accessed on the library's home page at **http://www.library.illinois.edu/prairie/inhs/**.

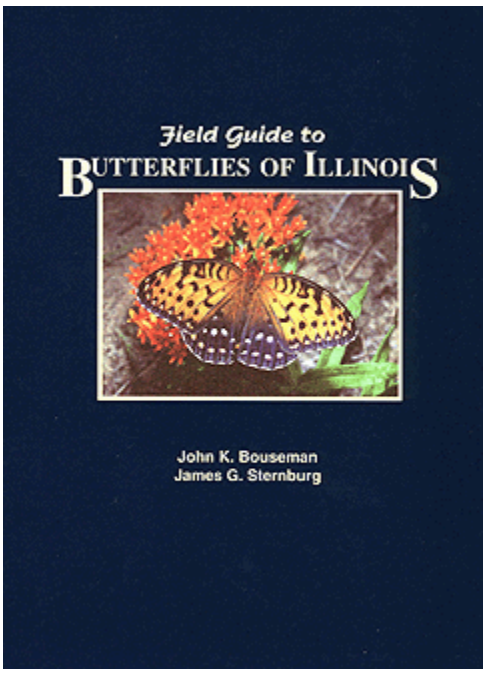
This year the INHS library added 26 new serial titles and 714 new books to the collection. Some of these books and journals were purchased while others were received through the exchange program or as donations from generous staff members and library supporters. This year the INHS library received two grants that helped strengthen the collection in the areas of watershed management, ecological restoration, catalogs, flora, and field guides. One grant was received through the Illinois State Library for $2,500 and the other was received through the Illinois Cooperative Collection Management Program for $3,200. In addition to maintaining the INHS on-line serials database and the binding of the serials, the backlog of uncataloged retrospective library materials is being reviewed and cataloged. These

retrospective materials consist of older books and journals that contain very important information about the flora and fauna from the early 1900s.

The INHS Library services included three library instruction workshops for online catalog searching, interlibrary loan services, and journal article searching. Another important service is photocopying articles for the staff. This year we received 974 requests for articles, an increase from last year's 638 requests. Personalized Current Contents searches are also available to all staff members.

Publications

By Charles Warwick



The Illinois Natural History Survey Publications Office provides printing and publishing assistance to Survey support staff, researchers, and the Education Outreach Office. In addition, we will occasionally help other natural sciences organizations closely allied with our mission with publishing efforts such as conference proceedings, informational brochures, and images for displays, posters, Web sites, and so on. We maintain an archive of 22,000+ images for the use of Survey staff and the public, and our images are used by organizations throughout the world. The Publications Office maintains a computer-graphics workstation with scanner and image-editing software. We provide consultation and training for INHS staff who wish to use the workstation.

During FY2001, our office published the *Field Guide to Butterflies of Illinois*, which received many favorable reviews from the news media including the Chicago *Tribune* and St. Louis *Post Dispatch*. The Barnes and Noble booksellling chain approached us about distributing this book in their Midwest outlets. We subsequently signed an agreement and distribution through Barnes and Noble will begin in fall of 2001.

CATEGORIES OF INHS PUBLICATIONS

- Bulletin: published continuously since 1876, this peer-reviewed journal reports on significant research findings by Survey scientists and other researchers in natural history.
- Biological Notes: published since 1933, this peer-reviewed publication presents research findings at INHS in a shorter, more concise, and less technical manner than the *Bulletin*. Each issue of the *Bulletin* and *Biological Notes* is mailed to various scientific and educational institutions throughout the world; additional copies are requested by ecologists, conservationists, and others throughout the nation.
- Manuals: published at irregular intervals since 1936, these field guides provide detailed descriptions and illustrations of a particular group of species, such as freshwater mussels, longhorned beetles, and amphibians and reptiles.
- Special Publications: the content of this series varies widely, from a collection of classroom activities for teaching biodiversity to school children to a compendium of the history and research of waterfowl in Illinois.
- *Illinois Natural History Survey Reports*: provide up-to-date information and announcements on many of the research activities of Survey scientists. This quarterly newsletter has been in continuous publication since 1962 and is free of charge to the public. Call the Survey Distribution Office at 333-6880 to be added to the mailing list, or view*INHS Reports* on the Web at: **https://www.inhs.illinois.edu/resources/inhsreports**
- Educational Materials: for both students and teachers in the natural sciences. These materials include posters, slide sets, classroom activities, laminated fact sheets and species identification cards for the yard and garden, and publications devoted to specific topics in natural sciences written for school children.
- On-line Publications: some of our publications are now accessible on the World Wide Web (Web). These include *Illinois Natural History Survey Reports, INHS Annual Reports,* INHS Manual 5 (*Field Guide to Freshwater Mussels of the Midwest*), INHS Manual 8 (*Field Guide to Amphibians and Reptiles of Illinois*), and the *INHS Publications Catalog*. Prices and ordering information for our publications and educational materials can be obtained at the Publications Catalog Web site at**https://www.inhs.illinois.edu/resources/inhspublications** or by contacting our distribution office at 333-6880 for a free copy of the INHS Publications Catalog.

INHS PUBLICATIONS IN PROGRESS DURING FY2001

- Manual 9, *Field Guide to Butterflies of Illinois*
- Manual 10, *Field Guide of Illinois Bumblebees*
- Bulletin 36(3), *A Revison of the Bees of the Genus* Tetraloniella
- INHS Special Publication 23, *Illinois Landowners Guide to Amphibian Conservation*
- *Illinois Natural History Survey Reports* (numbers 366-369)

ARTICLES AUTHORED BY INHS RESEARCHERS DURING FY2001

In addition to publications produced by INHS, our researchers contribute a significant number of articles to prominent scientific journals throughout the world as well as technical and research reports to

government agencies on the state and federal levels. The table below illustrates the types and numbers of publications produced by INHS researchers during FY2001.

Type of Publication/ Number

Scientific Journals / 114

Technical Reports/ 155

Miscellaneous (news articles, book chapters, Web pages, book reports, etc.) / 80

Ecosystem Management and Restoration Ecology

By Pat Brown and Jeff Brawn

Bob Szafoni (left) and Rick Larimore at Kickapoo State Park overlooking the Middle Fork River, Vermilion County.

The landscape of Illinois has been drastically altered since the first settlers arrived in the 1800s. The vast prairies, punctuated by forests, savannas, and wetlands, are gone and agricultural uses now dominate the land. More than 99% of the grasslands, 90% of the wetlands, and about 65% of the forests have been converted to other uses and nearly all of the remaining areas are degraded in some significant fashion. Rivers, streams, and water bodies of all sorts have been degraded by channelization, drainage, damming, and sedimentation. Despite these severe losses of habitat, opportunities exist in Illinois for large-scale management at the ecosystem level.

The Illinois Natural History Survey (INHS) has long conducted restoration and ecosystem research. We work in all the major ecosystems in Illinois including prairies and savannas, forests, wetlands, and waterways ranging from small streams to large rivers. The Survey is involved in many small- and large-scale restoration projects. Among these are the enormous Midewin National Tallgrass Prairie and the Lost Mound Unit of the Upper Mississippi National Wildlife Refuge (formerly the Savanna Army Depot). On these areas that were once military reservations, INHS scientists are cooperating with federal agencies in prairie and savanna restorations. Research is focusing on how various restoration and

management techniques affect the plant and animal communities. At Midewin, Survey scientists are cooperating with federal management biologists in prairie and savanna restorations, especially in monitoring birds and threatened and endangered plant species. The Lost Mound Unit is an area that was never plowed and is dominated by native sand prairie and savanna vegetation. Over time, road and building construction, intensive grazing, and the lack of natural fires have degraded the natural vegetation. INHS scientists at the Lost Mound Unit are working closely with the Fish and Wildlife Service to manage, restore, and monitor the response of the community in the 3,500-acre upland portion of the area.

Paul Marcum of INHS at a controlled burn at Pelville Cemetery Prairie, Butler Township, Vermilion County.

On the Cache River in southern Illinois, partial restoration of the normal hydrologic flows and channels is being studied by Survey researchers with the intent of providing information that will be useful in restoration of the river's rich lowland hardwood wetlands and forests. We also are involved in research that will help to restore the backwater lakes, wetlands, riparian forests and other habitats along the Illinois River.

At the James Edgar State Fish and Wildlife Area (formerly Site M), Survey scientists are comparing how traditional management practices and restoration at the ecosystem level affect the population ecology of the Northern Bobwhite.

Survey scientists are enthusiastic contributors to these conservation efforts, partnering with state and federal agencies and private organizations to restore and enhance Illinois' natural resources.

Ecosystem Management and Restoration Ecology Projects

- Evaluating the effects of reducing water levels in backwater habitats of large rivers during midsummer
  D. Wahl, J. Dettmers, B. Herwig

- Sewage treatment as ecosystem management
  D. Schneider
- Use of stable isotopes to examine food webs in the Illinois and Mississippi rivers
  B. Herwig, D. Soluk, D. Wahl, J. Dettmers
- Maintaining diversity in aquatic ecosystems: the causes and consequences of pigment variation
  G. Gerrish, C. Caceres
- Linking life-history traits to community dynamics in freshwater ecosystems
  C. Caceres, A. Tessier (Michigan State University)
- Analysis of aquatic resources in habitats out-of-the-pool in the Mississippi and Illinois rivers
  J. Chick
- Long Term Resource Monitoring Program: out-of-pool analysis
  J. Chick, M. Pegg
- Lake Chautauqua Habitat Rehabilitation and Enhancement Project (HREP)
  J. Stoeckel, K. Irons, T. Cook
- Long-term Illinois River Fish Population Monitoring Program
  M. McClelland, M. Pegg
- Watershed-scale effects of best management practices on stream fish and invertebrate populations in the Illinois Pilot Watershed Restoration Program
  D. Wahl, H. Dodd
- Effects of low-level phosphorus inputs on the Everglades ecosystem
  A. Edwards, D. Childers, J. Trexler, R. Jones (Southeastern Environmental Research Center, Florida International University)
- Frequency- dependent nest predation: implications for species coexistence and prairie management
  C. Whelan
- Reference stream characterization in the Northeastern Morainal Division of Illinois
  E. DeWalt
- Vegetation monitoring and comparative analysis of community integrity indices in habitat restorations at Nachusa Grasslands
  J. Taft, C. Houser (UIUC), K. Robertson
- Bird predation on insect herbivores: effects on plant fitness in experimental prairie restorations
  C. Whelan, G. Maina (UI-Chicago)
- Vegetation response to prescribed fire in an isolated and degraded prairie grove in central Illinois
  J. Ebinger, R. Larimore, J. Taft
- Effects of two experimental treatments, prescribed fire and leaf- litter removal, on a disjunct population of *Collinsia violacea*, an endangered species in Illinois
  J.B. Taft, E. Smith (Illinois Department of Natural Resources)
- Sand movement and vegetation patterns in blowouts in northwest Illinois sand prairies
  A. Symstad
- *Hudsonia tomentosa* survival following wildfire at Ayers Sand Prairie Nature Preserve
  A. Symstad

- Sand prairie soil seed banks: a comparison of sites in various states of degradation
  A. Symstad
- Effects of annual burning on populations of *Cassia fasciculata*(Fabaceae: Caesalpinioideae), with a review of its systematics and biology
  K. Robertson, D. Gardner (lay conservationist)
- Reference data collection for sand prairie restoration at Lost Mound
  A. Symstad
- Vegetational changes in dry- mesic forest after controlled burning in the Mississippi Palisades State Park, Carroll County, Illinois
  W. Handel, S. Neuendorf (Natural Land Institute)
- Seed dispersal, seed predation, and woody invasion of grasslands
  D. Wenny, A. Symstad
- Bell's Vireo (*Vireo bellii*) reproductive ecology and habitat selection
  C. Whelan
- Response of woodland birds to removal of woody understory
  C. Whelan, G. Maina (UI-Chicago)
- Biology and ecology studies of pathogens
  L. Solter, J. Maddox, K. Higgs, D. Pilarska (Bulgarian Academy of Sciences), C. Vossbrinck (Connecticut Agricultural Experiment Station), M. Henn (Technical University of Munich, Germany), J. Novotny (Forest Research Institute, Banska Stiavnica, Slovakia), A. Linde (Fachhochschule Eberswalde, Eberswalde, Germany), G. Csoka, Matrafured, Hungary, M. McManus (USDA Forest Service, CT)
- Earthworms in Illinois agroecosystems
  E. Zaborski
- Converting row-crop agriculture to bottomland forest: the influence of restoration on bird populations
  J. Hoover
- Monitoring a Neotropical migratory bird: implications for floodplain restoration
  J. Hoover
- The importance of floodplain forests for wintering birds
  J. Hoover
- The influence of agricultural in-holdings on the nesting success of forest songbirds
  J. Hoover
- The increase of *Asimina triloba* (L.) Dunal (pawpaw) in the Prairie Peninsula of Illinois
  R. Larimore, D. Busemeyer, J. Ebinger
- How prescribed fire and management affect plants and animals in oak-hickory forests
  C. Dietrich, E. Zaborski, D. Ketzner, J. Brawn, R. Szafoni, R. Larimore, J. Ebinger
- Applying spatial information technology to ecological risk assessment in Illinois
  J. Levengood, T. Weicherding, S. Lavin
- Ecosystem analysis, monitoring, and assessment
  L. Suloway
- Deer population control and its effects on understory vegetation in Chicago area forest preserves
  T. Van Deelen

- Classification and identification of critical wildlife habitat
  P. Brown, L. Chapa, T. Weicherding, B. Bahnsen, L. Suloway
- Illinois Gap Analysis Project
  P. Brown, T. Weicherding, L. Chapa, B. Bahnsen
- The vascular flora, lichens, and gastropods of Middle Fork Woods Nature Preserve
  R. Larimore, L. Phillippe, J. Ebinger, D. Ketzner, R. Szafoni
- Macroinvertebrate populations and marsh birds in managed wetlands of Richardson Wildlife Foundation
  P. Brown, V. Olinik
- Population ecology of Northern Bobwhite under artificial and natural management schemes
  J. Brawn, J. Siegrist
- Public attitudes toward wildlife in urban Illinois
  Craig Miller
- Ecology of white-tailed deer in urban forest preserves
  T. Van Deelen, D. Etter

Ecosystem Management & Restoration Ecology: Select Publications

Alleyne, M., and R.N. Wiedenmann. 2001. Suitability of lepidopteran stemborers for parasitization by novel-association endoparasitoids. BioControl 46(1):1-23.

Chiu, A., N. Chiu, N.T. Beaubier, J. Beaubier, R. Nalesnik, D. Sing, W.R. Hill, C. Lau, and J. Riebow. 2000. Effects and mechanisms of PCB ecotoxicity in food chains: algae-fish-seal-polar bear. Environmental Science and Health 18:27-152.

Dettmers, J.M., D.H. Wahl, D.A. Soluk, and S. Gutreuter. 2001. Life in the fast lane: fish and food webs in the main channel of large rivers. Journal of the North American Benthological Society 20:255-265.

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Fisheries Research

By David Wahl

Matt Raffenberg and Michelle Bowerman of the INHS Lake Michigan Biological Station prepare sediment samples.

Fisheries research in the Survey is diverse, forming the basis for monitoring, management, and protection of aquatic habitat throughout the state. The research we conduct is used to modify and improve fisheries management for the benefit of anglers in Illinois. A variety of management options is being evaluated, including stocking strategies and harvest regulations. The Survey is involved in studying fisheries at various locations throughout the state including several INHS biological stations.

Fish research on the Illinois and Mississippi rivers is conducted out of the INHS Illinois River Biological Station in Havana and Great Rivers Biological Station in Brighton, both with the Long-term Research and Monitoring Programs. At both stations we are monitoring conditions and learning more about the survival and reproduction of aquatic organisms. Many studies are being conducted, including continued evaluation of the status of mussel populations, the influence of commercial barge traffic, comparison of invertebrate communities on dredge spoil with those on natural substrates, and investigation of the use of moist-soil management units by fisheries.

Work at the INHS Lake Michigan Biological Station in Zion focuses on understanding yellow perch recruitment and assessing inshore fish populations. The inshore efforts primarily study smallmouth bass utilization of the newly installed artificial reef. Additional studies are assessing the potential impacts of round goby introductions. We also continue to conduct long-term creel surveys on Lake Michigan and Illinois impoundments. INHS scientists have conducted angler surveys on 68 state-managed lakes since 1987 to estimate the total fishing effort, the species, numbers, and weights of fish harvested and released, and the species targeted by anglers at these lakes. The data collected are directly applicable to the management of these lakes, especially in evaluating the effects of short-term management changes and supplemental stocking on yield and catch per angling effort and the impact of sportfishing intensity on the resource.

Eric Ratcliff (left) and Ben Lubinski pull at net full of bighead and silver carp from the Mississippi River near Alton.

Fisheries research at the INHS Kaskaskia, Ridge Lake, and Sam Parr Biological stations is addressing issues related to reservoir, pond and stream management, and have included past studies of muskellunge and walleye. Current studies are assessing potential management strategies to reduce stunting in bluegill populations and increase size structure. Studies of largemouth bass are attempting to understand recruitment mechanisms and stocking success. A variety of factors may influence survival of young largemouth bass including prey populations, environmental conditions, and angling, particularly during the spawning period. We are assessing each of these so that management efforts can be targeted towards the most important ones. We are also monitoring survival of different sizes of stocked largemouth bass to optimize hatchery production.

Wildlife Research

By Pat Brown

Franklin's ground squirrel.

Wildlife research at the Illinois Natural History Survey addresses a wide variety of issues. Some studies focus largely on individual species whereas others focus on landscapes or specific issues, such as the use of radar to detect nocturnal migrations of songbirds. Current research includes studies on a variety of mammals and birds as well as research on their habitats. Biologists often will use radiotelemetry in combination with other research methods to determine the survival, behavior, and population change in relation to different habitat conditions or other new methods and approaches to answer difficult questions. Information from these studies will improve our knowledge of the biology and habitat requirements of wildlife and will help managers and other researchers in many ways.

Research on species as diverse as Wild Turkey, Northern Bobwhite, Mallards, Prothonotary Warblers, white-tailed deer, red fox, coyotes, and Franklin's ground squirrels are helping biologists to better understand the population dynamics, importance of predators, and habitat needs of these species. Other research addresses issues at a broader geographic scale. One example is the Illinois GAP analysis, part of the national Gap Analysis Project, in which areas with high biodiversity are identified to aid conservation agencies and organizations. The results from this study will provide guidance to federal and state agencies on how best to protect the biodiversity of the landscape.

One new and rapidly growing area of research involving wildlife focuses upon humans--especially hunter and public attitudes and opinions as they relate to wildlife issues in Illinois. This research is varied and includes surveys of public opinions and attitudes on issues as diverse as hunter opinions about hunting regulation changes and attitudes of Chicagoans toward wildlife nuisance problems. Understanding the attitudes and opinions of the public is extremely important in management of wildlife.

An unusual quality of many wildlife research projects at the Survey is the long duration of study. Important long-term research is continuing. One notable example is research on Prothonotary Warblers in the Cache River watershed. Hundreds of nests have been monitored over the past nine years, resulting in an extraordinary understanding of the nesting requirements for this species and the habitat

conditions needed to create suitable habitat. This information has led to a clearer understanding of what is needed to restore watersheds for the Prothonotary Warbler. Some research in the Survey focuses upon the development of new techniques, such as the ability to monitor bird migrations using radar or to remotely monitor wildlife with radiotelemetry. Other research focuses on the plant communities that are vital to wildlife and important in their own rite as part of Illinois' natural heritage. One example is a study of the effect of deer on plant communities; another study is intended to evaluate changes in community structure of wetland plant communities in relation to hydrology (including flooding) and geographic location.

These and other studies on wildlife by the INHS provide the citizens of Illinois with a better understanding of the issues and help wildlife managers effectively administer state resources.

Researcher Shana Lavin holds red fox pup before release in wild.

Fish and Wildlife Research Projects

Sportfishing creel survey of the Illinois portion of Lake Michigan
J. Dettmers, D. Philipp

Growth and survival of nearshore fishes in Lake Michigan
J. Dettmers

Mechanisms affecting recruitment of yellow perch in Lake Michigan
J. Dettmers, B. Pientka, C. Caceres

Effects of food availability on recruitment of yellow perch in Lake Michigan
B. Graeb, J. Dettmers

Population viability of mottled sculpin in Black Partridge Creek
J. Steinmetz, D. Soluk

Reproductive ecology and impacts of catch-and-release angling in bass
D. Philipp, J. Claussen, D. Wahl, C. Suski, T. Kassler, J. Parkos

Creel surveys on Illinois impoundments
D. Benjamin, B. Carroll, L. Miller-Ishmael, D. Philipp

Physiological ecology of centrarchid fishes including energetics of parental care

Critical Trends Assessment Program: Monitoring

By Brenda Molano-Flores

Critical Trends Assessment Program researchers in field of coneflowers in the Manito Prairie of Tazewell County.

The Critical Trends Assessment Program (CTAP) is a long-term endeavor to monitor the condition of forests, wetlands, grasslands, and streams throughout the state of Illinois. The main purpose of conducting this project is to assess long-term changes in ecological conditions as well as to serve as a baseline from which to compare regional and site-specific patterns throughout Illinois. This program is unique because it is the first-ever attempt at a comprehensive assessment of the Illinois environment undertaken by state natural resource organizations.

A total of 600 sites representing 4 habitats (150 of each; 30 sites per habitat per year) have been randomly selected from across the state on both public and private land. Since 1997 the CTAP professional scientists of the INHS have been conducting the monitoring at these sites. As of this fall we have monitored 103 forest, 108 wetland, 98 grassland, and 150 stream sites. In forests, wetlands, and grasslands, data on herbaceous and woody vegetation, birds, and insects are collected. For each of these groups we measure among other things species richness, diversity, and dominance of native versus non-native, and threatened and endangered species. In the case of birds, we are also collecting data on cowbird parasitism. For streams we have gathered information on all species of fishes and for the insects groups known as mayflies, stoneflies, and caddisflies. In addition a Macroinvertebrate Biotic

Index (MBI) and Index of Biotic Integrity (IBI) is determined for each stream. Each of these sites will be revisited every five years. It is this five-year cycle for many years to come that is going to provide an understanding of the quality and quantity of our habitats.

It should be pointed out that the success of CTAP data collection depends on a cooperative effort between INHS professionals and EcoWatch citizen scientists. EcoWatch citizen scientists are part of the Illinois EcoWatch Network (RiverWatch, ForestWatch, PrairieWatch, and UrbanWatch), a statewide volunteer monitoring initiative collecting scientific data on Illinois rivers, forests, prairies, and urban green spaces. Protocols for this sister program are complementary to those of the professional scientists. The INHS professional scientists conduct detailed surveys at each habitat whereas the EcoWatch citizen scientists conduct a subset of procedures done by the professionals, but with less taxonomic resolution, at random and from volunteer-chosen locations. The combination of both data sets will allow us to have a better understanding about the quality and quantity of our habitats statewide.

Finally, the ultimate goal of CTAP is that the data gathered by INHS professionals and EcoWatch citizens will help scientists, local groups, lawmakers, state and federal agencies, and citizens in general to make better management, conservation, and policy making decisions regarding Illinois' forests, wetlands, grasslands, and streams. Additional information about CTAP and EcoWatch can be found in the following Web pages:

- **http://dnr.state.il.us/orep/inrin/ctap/ctaphome.htm**
- **http://dnr.state.il.us/orep/inrin/ecowatch**

Using CTAP Professional Monitoring Sites to Test Floristic Quality Assessment For the Forests, Wetlands, and Grasslands of Illinois

By Greg Spyreas

Connie Carroll of the INHS Critical Trends Assessment Program sites a tree at Hooper Branch Savanna.

Scientists, regulators, legislators, consultants, land managers, environmental professionals, not-for profit groups, and the general public have expressed a need for methods to assess and quantify the quality of natural areas. Additionally, they have looked for a means to identify pre-settlement habitat remnants, compare the floristic quality of different sites, and monitor the success of restoration efforts. Floristic Quality Assessment (FQA) was developed as a means of rapidly assessing the ecological integrity of natural areas. The original goals of this FQA were to identify high-quality natural areas, to compare floristic quality among sites regardless of community type, to monitor natural areas, and to track the success of restoration activities. FQA has become a popular tool recently to accomplish these goals. Floristic Quality Assessment utilizes coefficients of conservatism values (CC) assigned to plants in a region to obtain a Floristic Quality Index (FQI) for a given land area. To date we know of only a few studies that have tested the objectivity and utility of floristic quality assessment. In addition to the FQI, in Illinois identifying and ranking high-quality natural areas has followed the Illinois Natural Areas Inventory (INAI) criteria, which are on all counts a highly subjective and unrepeatable system for classification. Major criticism of both FQI and INAI criteria to assess floristic quality in Illinois is increasing. In this study using CTAP vegetation data, I address several questions that may help improve the way areas are assessed to determine their floristic quality: Is there a better, rapid, objective method of assessment than FQA or the INAI grading system that should be used to assess floristic quality in Illinois? What are the shortcomings of FQA? And where is it appropriate to be used? Are there deficiencies inherent in CC values, which makes FQA inherently flawed? Using vegetation data from the

Critical Trends Assessment Program, what does FQA tell us about a community? What is the quality of the vegetative communities in Illinois according to FQA values?

Summary of Stream Condition and Future Projects

By R. Edward DeWalt

Many Illinois streams have been straightened and deepened, had their local area tiled to improve drainage, and protective trees removed from their banks. These habitat alterations have led to increased water temperatures, dramatic fluctuations in runoff, and a drastic change in the food base from blown in tree leaves to that of algae. Consequently, up to 75% of all streams were rated only fair-to-poor in near-stream habitat quality. The consequences of this are that native fish and macroinvertebrate species have less suitable habitat on which to live and forage. Most streams also demonstrate current or past problems with organic enrichment, as determined by biotic indices that measure such pollution. Even those sites with relatively high scores for mayfly, stonefly, and caddisfly species richness still have biotic index scores indicating moderate levels of disturbance. The fish community in many CTAP streams was dominated by just 2 or 3 fish species, sometimes by 1 or more of the 15 introduced species found in the state. Regionally, some watersheds were better off than others, but none of the 10 Illinois Streams Information System watersheds ranked high on all stream quality indicators.

One current project using CTAP stream data involves the establishment of reference (least impaired) stream conditions within the greater Chicago area. Streams of highest quality in the region have been sampled and are being compared to CTAP data from random stream sites across the state and within the Chicago region. This work will culminate in some guidelines for evaluating stream condition within the Northeastern Morainal Natural Division of Illinois.

Comparisons Between Native and Non-native Plant Taxa Across Illinois

JAMES ELLIS, CONNIE CARROLL, AND GREG SPYREAS

Non-native species are an increasing problem across the state of Illinois. Either on purpose or by ignorance many of these species have been introduced. Because many of their natural enemies are not present, these non-native species spread without any control, invading our natural areas. In this project using CTAP data from forests, wetlands, and grasslands, we have been investigating how frequent non-native species are in these habitats. In addition, we are determining which portion (northern, central, and southern) of the state is affected the most by these non-native species. With four years of CTAP data we have been able to determine that forest sites have the highest species richness and FQI compared to wetland and grassland sites, and non-native species are the least dominant in forest sites and most dominant in grassland sites. Non-native species are more abundant in northern Illinois sites compared to central and southern Illinois. Across all sites, as non-natives become more dominant, total site diversity declines. Overall CTAP data show that non-native species are present in every habitat, are sometimes specific to a habitat, and may be distributed unequally within vegetation strata and regions of the state. The long-term monitoring being undertaken by CTAP will help determine the full impact of non-native plant species in Illinois.

The Effect of Patch Size, Degree of Isolation, and Habitat Quality on Bird Detection Rate in Forest, Wetlands, and Grasslands

RHETTA JACK, STEVE BAILEY, AND BRENDA MOLANO-FLORES

Rick Phillippe (left) and Jamie Ellis at Hooper Branch Savanna in Iroquois County.

Many bird species are declining over large segments of their ranges due to habitat loss, degradation, fragmentation, and cowbird parasitism. Using the bird data generated by CTAP, we want to determine how patch size and degree of isolation from a similar patch is affecting the detection rate (i.e., total number of times a given species is detected divided by total number of visited sites) of area-sensitive and habitat-dependent bird species in forest, wetland, and grassland sites. In addition, we want to determine how habitat quality, based on the vegetation data gathered at the sites, affects detection rate of bird species. So far, during 1997-2000, 110 forest, 109 wetland, and 97 grassland sites have been monitored. Overall, low detection rates for area-sensitive and habitat- dependent bird species have been found across all habitats. One of the greatest detection rates in forests was for Brown-headed Cowbirds, a nest parasite, at 76.3%. For grassland and forest species, the smaller a habitat patch becomes, the fewer area-sensitive species it supported. The low detection rates of area-sensitive species for all habitat types indicates the degraded and fragmented nature of those habitats.

CTAP Database

EDWARD CHEN AND R. EDWARD DEWALT

The Illinois Natural History Survey has set the centralization of CTAP data as a high priority. The INHS, using Illinois River Decision Support System (ILRDSS) funding, has provided a database manager, computers, software, space, and network administrative support for this purpose. These funds will be sufficient to begin the process of data centralization, but this is a large undertaking. Additional funds have been requested to add a database programmer and to purchase additional hardware and software to make a fully Web-compatible system. This database project will allow interested citizens, land managers, and politicians in the Illinois River basin and statewide to access the state's major source of standardized quantitative biological data in the Illinois Natural Resource Information Network (INRIN)

(see http://dnr.state.il.us/orep/inrin), with appropriate links to the Web-based ILRDSS. It will allow them to easily understand trends in threats and recovery of ecosystems across Illinois, generate increased interest in the CTAP program, and help to provide timely information to environmental policy makers.

ForestWatch / CTAP Professional Comparison Study

ALICE BRANDON

The quality of the data collected by volunteers is always questioned. In the CTAP program, data collection is a combination of both CTAP-INHS professional and EcoWatch citizen scientists efforts. Without the help of these citizen scientists the sample size of the CTAP data set will be substantially reduced. To assure that data collected by citizen scientists in all EcoWatch programs is of equal quality to that of CTAP-INHS professional scientists, periodic data quality checks are conducted by EcoWatch staff and INHS professional scientists. For example, we have been able to show that in the RiverWatch program volunteers identify taxa to an 80% or greater accuracy rate. In this project we want to determine if both CTAP-INHS professional and ForestWatch (FW) citizen scientists obtain similar results when assessing forest plant community conditions. Comparison questions will be limited by the level of data collected by FW in comparison to CTAP. For example, comparisons are expected to be fairly comprehensive when examining the tree data but less useful when examining the shrub data since FW does not identify all shrub species. Secondarily, we will also examine volunteer accuracy rates for tree and shrub identification. In this study, 20 forest sites will be monitored by citizen scientists and CTAP-INHS professional scientists.

CTAP PROJECT

Comparison of volunteer stream monitoring data (Illinois RiverWatch program) to professional monitoring data (CTAP)

R.E. DeWalt

Biodiversity

By Geoffrey Levin

Silvery salamander (*Ambystoma platineum*).

In late June, 2001, INHS scientists and others swarmed over Robert Allerton Park in east-central Illinois to participate in the Biodiversity Blitz, an intensive one-day effort to locate as many species as possible in the park. Despite the short time period, over 2,000 species were found, breaking the previous record for a single-day survey in the United States. Yes, Illinois is much more than fields of corn and soybeans surrounding urban landscapes. The "Prairie State" is also a place of natural habitats, and our remaining prairies--and savannas, forests, wetlands, streams, and lakes--are home to more than 53,000 species of plants, animals, and fungi.

That we know this much about the state's biodiversity is due largely to the efforts of Survey scientists for more than 140 years. Much of this knowledge is documented in the Survey's biological collections, which comprise more than 9 million individual organisms, the majority collected within Illinois. The specimens and the data associated with them, most of which are contained in computerized databases, are invaluable for identifying native and exotic species, studying their evolutionary history, and understanding their past and present distributions. The collections are heavily used by Survey scientists, scientists at other institutions worldwide, educators, students, policymakers, and the public. Information about the scope and use of the collections can be found on page 6 of this report.

Despite all we know about the Illinois biota, much remains to be learned. For the vast majority of species, we know almost nothing about their ecology and population dynamics, or how changes in the state's environment have affected their distributions. Biodiversity research at the Survey therefore continues to emphasize inventories of our flora and fauna, monitoring to determine changes over time, and studies of the ecology of individual species and natural communities, especially those known to be declining. Research during 2000-2001 included a variety of projects related to documenting and conserving biodiversity. The projects described in more detail below illustrate the range in scale of Survey research, from studies of a single species (the eastern massasauga) to statewide surveys of all groups (the Statewide Biological Survey and Assessment Program).

Plants and animals do not recognize political boundaries, and Survey scientists are involved in projects outside Illinois. These range from surveys of plants, worms, and aquatic insects as part of the All-Taxon Biotic Inventory of Smoky Mountains National Park to expeditions to Tasmania, New Caledonia, and Kyrgyzstan. Studies like these provide a regional, national, and global context to the Illinois biota, a context that is vital not only to validate scientific research, but also to provide the information needed as Illinois grapples with global climate change and invasive species riding the coattails of world trade.

STATEWIDE BIOLOGICAL SURVEY AND ASSESSMENT PROGRAM

Geoffrey Levin and Chris Phillips

The Illinois Natural History Survey's Center for Biodiversity is the home of the Statewide Biological Survey and Assessment Program, which is supported by a long-term contract with the Illinois Department of Transportation (IDOT). Members of this program conduct biological surveys and environmental assessments, especially for threatened and endangered species and high-quality natural communities, within IDOT project areas. Staff also assess potential wetland mitigation sites and monitor created wetlands at these sites. This is one of the few programs in Illinois that assesses biodiversity throughout the state (for another, see the Critical Trends Assessment Program section of this Annual Report).

This contractual relationship with IDOT goes back almost 20 years; the program in its current form has been in operation for more than 10 years. It has grown to approximately 25 full-time staff (including 10 with Ph.D.s), 5 graduate research assistants, and 5-10 hourly assistants, and a budget that now exceeds $1.5 million annually. In FY2001, surveys were conducted at 65 sites in 43 counties, and monitoring was conducted at 4 wetland mitigation sites in 4 counties. Recently the program's botanists initiated a survey of railroad prairies paralleling highways because these sites are crucial for planning, management, and mitigation of highway projects.

The Statewide Biological Survey and Assessment Program is a mutually beneficial relationship between IDOT and the INHS. For its part, IDOT obtains the services of a highly qualified group of scientists who provide unbiased scientific data and interpretation. A similarly strong and diverse staff cannot be found elsewhere, including the private sector. Furthermore, the Survey's long history of sound science imbues the program, strengthening IDOT's own credibility.

The INHS also benefits significantly from the program. The staff members bring scientific expertise to the Survey that it otherwise would not be able to afford. These scientists are resources not only for the program, but they also are available to consult with staff throughout INHS, elsewhere in the Illinois Department of Natural Resources, and outside the agency on issues statewide. The Surveys' scientific collections receive significant financial support in terms of supplies and salaries for collection management staff, and program staff contribute large numbers of specimens to the collections as a result of their work. Our ability to survey and document the state's flora and fauna are greatly enhanced. The provisions of the contract also allow program staff to conduct some independent research, and many have active research programs in systematics and ecology. Clearly the program contributes significantly to the research, education, and outreach missions of the Survey.

Prairie smoke, a plant found in the northern third of Illinois in gravel and sand prairies.

THE EASTERN MASSASAUGA AT CARLYLE LAKE

Chris Phillips

At the time of European settlement, the eastern massasauga rattlesnake was found throughout the northern two-thirds of Illinois. Within a few years, however, habitat destruction and outright persecution reduced the Illinois range of the massasauga to a few widely scattered populations. As early as 1890 it was noted that the massasauga was in decline, and today only three or four populations remain in Illinois. Only the population at Carlyle Lake in Clinton County is thought to be large enough to have any hope of surviving the next 20 years.

In 1994, the massasauga was listed as endangered in Illinois and this resulted in increased interest in the welfare of the species. More recently, plans for commercial development at Carlyle have been presented by various government agencies and private groups that have caused the Illinois Department of Natural Resources (IDNR) to step up its investigations into the status of the massasauga at Carlyle. In response to this need, we started studying the massasauga at Carlyle Lake in autumn of 1998. The initial purpose of the study was to conduct a systematic survey for massasaugas at one of the two IDNR-owned or managed properties at the lake, South Shore State Park. The early results indicated that as many as 100 massasaugas might exist at the main study site at South Shore State Park. An in-depth analysis of the specific locations where massasaugas were found suggests that during egress massasaugas select locations closer to retreats (crayfish holes or logs) and shrubs rather than random

locations. This proximity to cover may allow massasaugas to escape predation, especially from aerial predators, such as hawks.

The next phase of the research at Carlyle focused on radio-tracking adult massasaugas to investigate their movement patterns, habitat preferences, and home range size. This phase has been very successful with over 20 snakes involved to date. Most of our telemetered snakes did not move more than a few hundred meters from their hibernation point during the entire activity season (March through October) and most occupied less than four acres during this period. Our telemetered massasaugas occupied a variety of habitats, ranging from old field to autumn olive thickets.

The final product of these efforts will be a better picture of how many massasaugas live at Carlyle Lake and how they utilize the various habitat types at the lake. This information will be used to direct commercial development away from the areas that are used by massasaugas. We hope it will also be part of a larger management plan that includes purchase of additional habitat and educational programs that counter the antisnake press already in existence.

BIODIVERSITY PROJECTS

An experimental investigation of the dispersal ability of freshwater invertebrates
C. Caceres, D. Soluk

Ecology of the federally listed endangered Hines emerald dragonfly, *Somatachlora hineana*
D. Soluk, L. Pintor, S. Foster

Foraging mode and the prediction of the impact of multiple predators on prey populations
H. Vance, D. Soluk

Solar radiation, growth dilution, and metal accumulation by autotrophic biofilms
W. Hill, I. Larsen

Factors inducing and terminating dormancy in zooplankton
C. Caceres, A. Rachubinski, A. Andreou

Conservation ecology and genetics of black rat snakes
G. Blouin-Demers, P.J. Weatherhead, H.L. Gibbs

Reproductive ecology of northern water snakes
K.J. Kissner, P.J. Weatherhead

Relationship between fish biodiversity and ecosystem structure and function
K. Ostrand, D. Wahl

Systematics and fingerprinting of Microsporidia
L. Solter, J. Maddox, J. Vavra (Charles Univ., Prague, Czech Republic), C. Vossbrinck (Connecticut Agricultural Experiment Station, New Haven, CT)

Computerized Databases

Atlas of North American Freshwater Mussels: Preliminary Species Accounts
K. Cummings

Bibliography of the Freshwater Mussels (Unionoida) of North America
K. Cummings, C. Mayer, G. Watters (Ohio State University), and A. Bogan (North Carolina Museum of Natural Science)

Nomenclatura Oligochaetologica--Supplementum Quartum: A catalogue of names, descriptions, and type specimens of the Oligochaeta
M. Wetzel, J. Reynolds (Oligochaetology Laboratory, Kitchener, Ontario)

An Ephemeroptera, Plecoptera, and Trichoptera (EPT) specimen database, Internet access and GIS mapping
E. DeWalt, C. Favret

Integration of INHS databases for the Illinois River Decision Support System
E. Chen, E. DeWalt, M. Pegg, G. Levin

Fungi

Revision of the genus Torula
L. Crane, J. Hughes (Agriculture Canada)

Taxonomic and genetic identification of the horseradish root discoloration pathogen
W. Chen, M. Babadoost (UIUC), C. Eastman

World Host Index of the Meliolaceae (Ascomycetes)
A. Jones (UIUC), J. Crane

Population genetics and host preference of the fungus Phialophora gregata
X. Meng, W. Chen, C. Grau (University of Wisconsin)

Sympatric population of the soybean brown stem rot pathogen
Y. Chen, W. Chen, C. Grau (University of Wisconsin)

Nomenclator of sanctioned names of fungi
L. Crane

General

Mary Ann Feist measuring tree diameter in Dean Hills Nature Preserve.

Biological study of the Galena River
W. Handel, C. Phillips

Survey for populations of the mudpuppy (*Necturus maculosus*) and salamander mussel (*Simpsonaias ambigua*) in Illinois
K. Cummings, C. Phillips, C. Mayer, J. Petzing

Biological inventories of C2000 Ecosystem Program grant project sites
K. Cummings, L. Page, C. Phillips, C. Mayer

Surveys for endangered and threatened plants and animals and high-quality natural communities at Illinois Department of Transportation project sites
G. Levin, C. Phillips, and CBD-Statewide Biological Survey and Assessment staff

Inventory of terrestrial arthropods and vascular plants of the grasslands of Kyrgyzstan
C. Dietrich, J. Taft, R. Phillippe, D. Novikov, N. Novikova

The biodiversity, hydrogeology, and water quality of springs in Illinois
D. Webb, M. Wetzel

Invertebrate: Annelids

Aquatic and Terrestrial Annelida (Acanthobdellae, Aphanoneura, Branchiobdellae, Hirudinea, Oligochaeta, and Polychaeta) of North America
M. Wetzel, K. Coates (Bermuda Biological Station for Research), R. Kathman (Aquatic Resources Center, College Grove, TN), K. Fauchald (USNM-Smithsonian Institution), B. Healy (University College, Dublin, Ireland)

The aquatic Annelida (Hirudinea and Oligochaeta) of the Colorado River and its tributaries, Grand Canyon National Park, Arizona
M. Wetzel, D. Blinn, J. Shannon (Northern Arizona University)

The aquatic Annelida of the Great Smoky Mountains National Park, North Carolina and Tennessee
M. Wetzel

The Tubificidae (Annelida, Oligochaeta) associated with sediments in Pop's Cave, Wisconsin
M. Wetzel, H. Swayne, M. Day (University of Wisconsin, Milwaukee)

The diversity and density of aquatic Oligochaeta (Annelida) associated with sediments in cave streams in Illinois and Missouri
S. Taylor, M. Wetzel, D. Webb

The freshwater Oligochaeta (Annelida: Oligochaeta: Enchytraeidae, Lumbriculidae, Naididae, Tubificidae) from the Lesser Antilles
M. Wetzel, D. Bass (University of Central Oklahoma)

Invertebrate: Arthropods

Don Webb sampling isopoda and Oligo-cheta in Illinois Caverns in Monroe County.

Revision of genera in Therevidae (Diptera)
D. Webb, M. Irwin (UIUC)

Winter stoneflies of Illinois
D. Webb

Ephemeroptera, Plecoptera, and Trichoptera (EPT) species composition at Forest Glen Forest Preserve, Vermilion County, Illinois
R. DeWalt

Status of the genus *Heterostylum* in Illinois
D. Webb

New species of *Chrysopilus* from New Caledonia
D. Webb

The origin of parasitism in Psocodea
K. Johnson, M. Whiting (Brigham Young University), S. Barker (University of Queensland).

Phylogeny of the major lineages of leafhoppers and treehoppers (Hemiptera: Membracoidea)
C. Dietrich, R. Rakitov

Establishing baseline data on seasonal physiological requirements for *Gammarus acherondytes* and *Gammarus troglophilus* in relation to microbial oxygen demand
S. Taylor, G. Adams (SIUC)

Spatial and temporal analyses of the bacterial fauna and water, sediment, and amphipod tissue chemistry within the range of *Gammarus acherondytes*
S. Taylor, D. Webb, S. Panno (Illinois State Geological Survey)

Microdistribution of subterranean Amphipoda (Crustacea) of Illinois' Salem Plateau
S. Taylor, D. Webb

Secretory products of the Malpighian tubules in the biology and evolution of Cicadomorpha (Hemiptera)
R. Rakitov

Life histories of waterstriders of the Sangamon River, Champaign County, Illinois
S. Taylor

Distribution of Illinois semiaquatic bugs
S. Taylor, J. McPherson (SIUC)

Evolution of *Cinara* aphids on U.S. pinyon pines
C. Favret

Life cycles of Trichoptera (Caddisflies) and bacterial and agricultural pesticide contamination of an Illinois River bluff springbrook, Utica, Illinois
E. DeWalt, N. Flocca

Evolution of a novel ovipositional behavior in the neotropical leafhopper tribe Proconiini (Insecta: Hemiptera: Cicadellidae)
C. Dietrich, R. Rakitov

Stonefly fauna of Iowa
E. DeWalt, D. Heimdal

Use of Ephemeroptera, Plecoptera, and Trichoptera (EPT) as indicators of stream health
R.E. DeWalt

Comparative morphology of leafhopper nymphs (Insecta: Hemiptera: Cicadellidae)
R. Rakitov

Revision of the treehopper subfamily Nicomiinae (Hemiptera: Membracidae)
C. Dietrich

Biodiversity of Cicadellidae (Hemiptera: Cicadomorpha) in the Amazonian rainforest canopy
A. Wallner (UIUC), C. Dietrich

Stonefly fauna of the Great Smoky Mountains National Park
E. DeWalt, B. Heinold

Description of new crayfish species from Kentucky
C. Taylor

Response of macroinvertebrate community to land-use changes in the headwaters of the Mackinaw River basin
E. DeWalt, M. Herbert

Comparison of historical and contemporary Ephemeroptera, Plecoptera, and Trichoptera (EPT) assemblages across Illinois

R.E. DeWalt, D. Webb, A. Soli, T. Kompare

Phylogeny of avian lice (Ischnocera) and the evolution of microhabitat specialization
K. Johnson

Molecular systematics of midwestern crayfishes in the genus *Orconectes*
C. Taylor

Invertebrate: Mollusks

Assessment of the status of the freshwater mussels (Bivalvia: Unionidae) in the Mackinaw River drainage in Illinois
K. Cummings

Status survey for three species of Illinois endangered freshwater mussels: round hickorynut, pyramid pigtoe, and rayed bean
K. Cummings, C. Mayer

Plants

Rick Phillippe (right) and Dan Busemeyer surveying vegetation at Dean Hills Nature Preserve, Fayette County, IL.

A botanical site inventory of the Green River State Conservation Area, Lee County, Illinois
R. Phillippe, W. Handel

Vascular flora of the Dean Hills Nature Preserve, Fayette County, Illinois
M. Feist, R. Phillippe

A botanical site inventory of the Middle Fork Woods Nature Preserve, Vermilion County, Illinois
R. Phillippe, R. Larimore

Systematics of *Acalypha* and *Drypetes* (Euphorbiaceae)
G. Levin

Monographic studies on the plant family Malvaceae
(genera *Alcea*, *Althaea*, *Malva*,*Malvastrum*, *Sidalcea,* and *Urena*) for *Flora of North America*
S. Hill

Status assessment of the Illinois endangered false mallow (*Malvastrum hispidus*)
S. Hill

Systematic studies of Rosaceae for *Flora of China*
K. Robertson

Systematic Studies of *Jacquemontia* (Convolvulaceae)
K. Robertson, D. Austin (Florida Atlantic University), J. Tapia (Centro de Investigación Científica de Yucatán, México)

Amaranthaceae, *Erythronium*, and Haemodoraceae for *Flora of North America*
K. Robertson, S. Mosyakin (National Academy of Sciences of Ukraine), G. Allen (University of Victoria, British Columbia, Canada)

Conservation genetics in Baker's larkspur, *Delphinium bakeri* (Ranunculaceae)
J. Koontz, H. Forbes (University of California, Berkeley)

Vascular flora of Matanzas Prairie and Long Branch Sand Prairie, Mason County, Illinois
M. Feist, R. Phillippe

Amaranthaceae in the southeastern United States
K. Robertson

Monitoring *Boltonia decurrens*, decurrent false aster, at Marshall State Fish and Wildlife Area
R. Phillippe

A botanical site inventory of the Iroquois County Conservation Area and the Hooper Branch Savanna Nature Preserve, Iroquois County, Illinois
R. Phillippe

Floristic survey of Riedle's Bluffs Natural Heritage Landmark and Illinois Natural Areas Inventory Site in Clark County
J. Taft, M. Solecki (IL Nature Preserves Commission)

Floristic survey of riparian communities along the Sangamon River at the proposed River Bend Recreation Area, Champaign County, Illinois
R. Phillippe

Vascular plant and lichen flora of the Great Smoky Mountains National Park
R. Phillippe

A vascular flora of Stephen A. Forbes State Park, Marion County, Illinois
D. Ketzner, R. Phillippe

Vascular flora of the Vermilion River Observatory, Vermilion County, Illinois
R. Phillippe, D. Ketzner, R. Larimore, J. Ebinger

A site inventory of the Green River State Conservation Area, Lee County, Illinois
R. Phillippe, W. Handel, R. Larimore, J. Ebinger

Vascular flora of Dean Hills, Fayette County, Illinois
M.A. Feist, D. Busemeyer, L. Phillippe, J. Ebinger

Vascular flora of the Middle Fork Woods Nature Preserve, Vermilion County, Illinois
R. Larimore, L. Phillippe, J. Ebinger

Botanical surveys for the All Taxa Biological Inventory of Great Smoky Mountains National Park
L. Phillippe, M.A. Feist, D. Busemeyer, R. Larimore

Vertebrates

A status survey of Franklin's ground squirrel in Illinois
J. Hofmann, E. Heske, J. Martin

Abundance and distribution of grassland and forest birds in northwestern Illinois
D. Wenny

Spring and fall migrant bird use of river dune forest and savanna
D. Wenny

Stomach content analysis of Illinois birds
D. Wenny, A. Caparella (Illinois State University)

The reproductive success of the silvery salamander (*Ambystoma platineum*) at a man-made pond in Vermilion County, Illinois
J. Mui, J. Petzing, C. Phillips

The distribution of the eastern grey tree frog and Copes grey tree frog in Illinois
J. Mui, E. Conrad, C. Phillips

Home range, habitat use, and reproductive ecology of the eastern massasauga (*Sistrurus catenatus*) at Carlyle Lake
C. Phillips, M. Dreslik, B. Jellen, D. Shepard

Fishes of Illinois
L. Page, M. Retzer, D. Thomas, B. Burr, J. Stewart, R. Heidinger SIUC)

Changes in the fish fauna of seven Illinois basins
M. Retzer

The population genetics of host specificity: waterfowl lice
K. Johnson, K. McCracken (University of Alaska)

Bat survey of Scott Air Force Base, St. Clair County, Illinois
J. Hofmann, B. Sietman, C. Martin (U.S. Army Corps of Engineers)

Foraging under gut constraints: reconciling two schools of thought
C. Whelan, J. Brown (UI-Chicago)

The effects of temperature and duration of incubation on the survivorship of the eggs of the marbled salamander (*Ambystoma opacum*)
J. Mui, J. Petzing, C. Phillips

Rarest of the rare animal species of Illinois
L. Page, M, Retzer, C. Taylor

Swainson's Hawk ecology and conservation
D. Wenny, D. Kirk (Illinois Department of Natural Resources), T. Coleman (UIUC)

Small mammal survey of upland sand habitats at the Savanna Army Depot, Jo Daviess and Carroll counties, Illinois
J. Hofmann, E. Heske

Site fidelity, return rates, and reproductive success of Grasshopper Sparrows
D. Wenny

Phylogenetics of pigeons and doves of the world
K. Johnson

Coevolutionary history of pigeons and doves and their lice
K. Johnson, D. Clayton (University of Utah)

Latitudinal test of the escape hypothesis
D. Wenny, J. Tewksbury (Savanna River Ecology Laboratory, South Carolina)

Ectoparasites of birds in Illinois
K. Johnson

Effects of site management on avian fauna of Babe Woodyard State Natural Area, Vermilion County, Illinois
S. Amundsen

Host relationships of Kyrghyz bees and meloid beetles
J. Bouseman

Meloid beetles of Illinois
J. Bouseman

Native bees and pollination
J. Bouseman

Prairie insects of Illinois
J. Bouseman, J. Sternburg (UIUC, retired)

Silk moths and emperor moths of Illinois
J. Bouseman, J. Sternburg (UIUC, retired)

Skippers of Illinois
J. Bouseman, J. Sternburg (UIUC, retired), J. Wiker (IL State Museum)

Survey of Illinois earthworms
E. Zaborski

Bipalium adventitium, a flatworm predator of earthworms
E. Zaborski

Phasmarhabditis sp. nematodes parasitizing Lumbricus terrestris earthworms
E. Zaborski

Male Diana fritillary (*Speyeria diana*).

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Insect Management

By Catherine Eastman

Western corn rootworm adult.

Survey entomologist George Decker acknowledged the difficulties in managing insect pests when he wrote in 1958, "Insects are dynamic creatures subject to constant change in characteristics. Because of their great mutability, insects have survived in an ever-changing world for millions of years and are still capable of making the necessary adjustments to many of the important changes in their environment." "Pest" is an arbitrary term; only a very small percentage of insect species require management. However, challenges such as new agricultural crops, urbanization, behavioral changes in old pests, and the arrival of new ones, insect management programs cannot remain static. The emergence of crop rotation-resistant western corn rootworm populations in Illinois is a case in point. Rapid expansion in the use of genetically engineered crops is yet another area commanding the attention of Survey

scientists. One project is investigating how crop residues from "Bt corn" varieties may affect soil processes and nontarget soil invertebrates.

A continuing strength of the Survey is its focus on interdisciplinary research teams. For example, Survey and University of Illinois researchers are leading a multistate investigation of causes of declining persistence of forage alfalfa stands. Their work will determine the roles of insect pests, diseases, weeds, weather, soil characteristics, and management practices so that an integrated plan to improve stand persistence can be developed. Additional multidisciplinary projects include evaluation of rootworm transmission of soybean diseases and the potential of high-glucosinolate varieties of crucifers to reduce insect pest and weed problems. Survey entomologists continually recognize the critical nature of interdisciplinary approaches to science and insect management.

Insect Management Projects

Deer ticks: male (small) and female.

Habitat selection and species diversity of migratory aphids in adjacent agricultural and natural habitats
C. Favret, D. Voegtlin

Ticks and tick-borne diseases in Illinois
J. Bouseman, J. Nelson (North Park University and Rush Medical College)

Host-parasite physiological interactions
R. Wiedenmann, M. Alleyne, C. Helm, R. Kfir (Plant Protection Research Institute, Pretoria, South Africa)

Pest management with glucosinolate-rich crucifers
C. Eastman, C. Velasquez (UIUC), J. Masiunas (UIUC), M. Kushad (UIUC), E. Wahle (UIUC), J. Aguyoh (UIUC)

Horseradish pest management and productivity
C. Eastman, W. Chen

Statewide dispersal of rootworms into soybeans
E. Levine, J.L. Spencer, S.A. Isard (UIUC), E.A. Adee (Monmouth, IL), R.A. Hines (Dixon Springs, IL), L.E. Paul (DeKalb, IL), G.A. Raines (Perry, IL)

Response of rootworms to different soybean lines
E. Levine, J.L. Spencer, M.E. Gray (UIUC), R.L. Nelson (USDA), R.B. Hammond (Ohio State Univ.), C. Pierce (UIUC), S.A. Isard (UIUC)

Rootworm transmission of soybean diseases
E. Levine, S.A. Isard (UIUC), T.R. Mabry (UIUC), J.L. Spencer, H.A. Hobbs (UIUC), G.L. Hartman (USDA), W.L. Pedersen (UIUC)

Rootworms that oviposit in soybeans
E. Levine, N. Mihelcic (Univ. of Guelph, Canada), A. Schaafsma (Univ. of Guelph, Canada), J.L. Spencer

Movement and mating of adult western corn rootworms in east-central Illinois cornfields
J. Spencer, D. Onstad (UIUC), E. Levine, S. Isard (UIUC)

Soybean foliage consumption reduces vigor of adult western corn rootworms
J. Spencer, T. Mabry (UIUC), S. Isard (UIUC), E. Levine

Abundance and daily patterns of WCR flight between corn, soybeans, and other crops
J. Spencer, T. Mabry (UIUC), S. Isard (UIUC), E. Levine

Evaluation of Kairomone traps for western corn rootworm monitoring
J. Spencer, T. Mabry (UIUC), E. Levine, S. Isard (UIUC)

Western corn rootworm adult mortality following consumption of transgenic corn
J. Spencer, T. Mabry (UIUC)

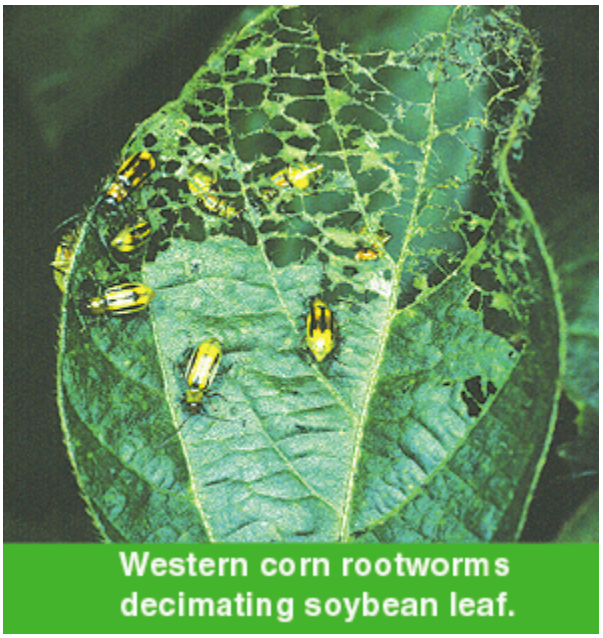
Insecticide evaluation of field, forage, fruit, and vegetable crops
J. Shaw, M. Gray (UIUC), K. Steffey (UIUC), R. Weinzierl (UIUC), C.E. Eastman

Using transgenic corn tissue as a novel marker for dispersal studies
J. Spencer, T. Mabry (UIUC)

Influences of insecticides and transgenic corn in soil ecosystems
E. Zaborski

Fungus gnats and their natural enemies in greenhouses
E. Zaborski, R. Cloyd (UIUC)

INSECT MANAGEMENT SELECT PUBLICATIONS



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INVASIVE/EXOTIC SPECIES

By Robert N. Wiedenmann and Charles G. Helm

The terms "invasive species" and "exotic species" are often mistakenly interchanged. Although many of the invasive species in Illinois are indeed exotic, not all exotic species are invasive, and not all invasive species are exotic. Exotic species can become invasive when the biotic checks from their native homes do not accompany them into the new habitats--and their populations subsequently grow unchecked. Examples of exotic species that are also invasive range from the gypsy moth, which was introduced into North America in the 1870s, to the soybean aphid, first detected in the Midwest in 2000. Yet, in some cases, an exotic origin is not needed to classify an organism as invasive. Regardless of its source, any species introduced into a new area may be considered an invasive should it spread unchecked, disrupting habitats, affecting native species, and even transforming ecosystems. True costs of the numerous invasives are unknown, but have been estimated to exceed $100 billion per year.

A number of INHS scientists study invasive species, seeking solutions to the problems these species cause. Basic research focuses on understanding the processes of invasion, identifying the traits that allow certain species to become invasive, and determining the characteristics of habitats that predispose them to invasion. Applied research focuses on intervention techniques to stem the growth and spread of these species.

Solutions to invasive species are not easily found, but several Survey projects are beginning to have an effect on selected invasives, such as the biological control project against as purple loosestrife. Other species, such as the zebra mussel, still defy control measures. Likewise, new invasive species will undoubtedly emerge, despite efforts to prevent their arrival into Illinois. Survey scientists will continue to study the ecological and economic costs of invasive species to the state, and our scientists represent the best chance to find long-term, sustainable solutions to those problem species.

INVASIVE / EXOTIC SPECIES PROJECTS

Reducing risk of aquatic nuisance species spread via baitfish
P. Charlebois

Trophic transfer of PCBs: zebra mussels and round gobies
P. Charlebois

Invasive aquatic plant outreach including biological control of purple loosestrife by 4-H field volunteers
P. Charlebois, R. Wiedenmann, D. Voegtlin

Zebra mussel metapopulation dynamics
D. Schneider, R. Sparks, K. Blodgett, J. Stoeckel, C. Rehmann, D. Padilla

Carp, culture, and a century of exotic species introductions: an environmental history
D. Schneider, G. Sandiford

Exotic zooplankton in the upper Mississippi River
J. Stoeckel

Implications of the introduction of *D. lumholtzi* on fish and zooplankton assemblages
D. Wahl, C. Kolar

Effects of common carp on aquatic communities
D. Wahl, V. Santucci, J. Parkos, M. Wolfe

Investigation of the potential for red imported fire ant (*Solenopsis invicta*) impacts on rare or endangered karst invertebrates at Fort Hood, Texas
S. Taylor

A Nearctic pest of Pinaceae accidentally introduced into Europe: *Leptoglossus occidentalis* (Heteroptera: Coreidae) in northern Italy
S. Taylor, G. Tescari, M. Villa (Associazione Entomologica Naturalistica, Italy)

Control of the Asian longhorned beetle
L. Solter, J. Cate (Integrated BioControl Systems, Inc., IN), L. Hanks (UIUC), M. McManus, M. Keena (USDA Forest Service, CT)

Control of the gypsy moth in Illinois
L. Solter, K. Higgs, J. Cavanaugh (Illinois Dept. of Agriculture)

Biological control of purple loosestrife
R. Wiedenmann, D. Voegtlin, S. Post, C. Helm

Biological control of alfalfa blotch leafminer
R. Wiedenmann, J. Lundgren (UIUC)

Impacts of purple loosestrife on nesting wetland birds
R. Wiedenmann, J.D. Maddox (UIUC)

Garlic mustard ecology and biological control
R. Wiedenmann, E. Gault (UIUC), J. Lundgren (UIUC)

INVASIVE / EXOTIC SPECIES SELECT PUBLICATIONS

INHS Chief David Thomas collects round gobies at the Cal Sag Canal near Romeoville, IL.

Charlebois P.M., M.J. Raffenberg, and J.M. Dettmers. 2001. First occurrence of *Cercopagis pengoi* in Lake Michigan. Journal of Great Lakes Research 27:258-261.

Chen, W., C.R. Grau, E.A. Adee, and X.-Q. Meng. 2000. A molecular marker identifying subspecific populations of the soybean brown stem rot pathogen *Phialophora gregata*. Phytopathology 90:875-883.

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Solter, L.S., D.K. Pilarska, and C.F. Vossbrinck. 2000. Host specificity of microsporidia pathogenic to forest Lepidoptera. Biological Control 19:48-56.

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Villa, M., G. Tescari, and S.J. Taylor. 2001. Nuovi dati sulla presenza in Italia di*Leptoglossus occidentalis* (Heteroptera Coreidae). Bollettino della Società Entomologica Italiana.

MEDICAL ENTOMOLOGY

By Robert Novak

Tim Schaub uses an aspirator to collect mosquitoes in a central Illinois woodland.

The Medical Entomology Program at the Illinois Natural History Survey was mandated by the Illinois Waste Tire Act to carry out original research on the biology and control of mosquitoes found primarily in tire casings and associated artificial containers throughout Illinois. The broad objectives of this research program are to 1) study the biology of container-inhabiting mosquitoes and the pathogens they

transmit, 2) develop and help implement effective and safe mosquito and mosquito-borne disease management practices, 3) investigate and provide current and pertinent biological information on the environmental impact of exotic and local mosquito species, and 4) assist in the development of educational materials and training programs for state, county, and municipal agencies and the general public.

The invasion and rapid establishment of *Aedes albopictus*(the Asian tiger mosquito) in used tires and other water-holding containers, coupled with the impending movement of West Nile Virus (WNV) and the re-emergence of St. Louis Encephalitis virus in Illinois, remain the major topics of research for the program. Because the Mississippi River basin is a popular flyway for migratory birds, Illinois is at risk for the introduction of WNV. The principal mosquito vector, *Culex pipiens*, is indigenous to the state as are 9 of the 11 WNV-vectoring mosquito species (7 species are found in used tires).

Research on mosquitoes and other arthropods found in Illinois can be placed into two primary categories, public and environmental health. Our investigations provide the technical means to address important questions for the state in order to reduce the risks associated with mosquitoes and mosquito-borne pathogens to humans, domestic animals, and wildlife. By using the ecological information from our research and by employing the technological tools we have developed, we can address fundamental questions on the nature of mosquito-borne diseases in order to develop environmentally safe management practices.

MEDICAL ENTOMOLOGY PROJECTS

Rich Lampman if the INHS Medical Entomology lab tests a new insecticide.

Population dynamics of vector mosquitoes in Illinois
R. Lampman, R. Novak, N. Krasavin

Molecular identification and function of endosymbionts in vector mosquitoes
R. Novak, L. Kent (UIUC)

Exotic mosquitoes and associated pathogens in Illinois
R. Novak

Succession of mosquito species in a reclaimed wetland--Spunky Bottoms
R. Novak

Chemical ecology and toxicology of mosquitoes
R. Lampman, R. Novak

Dog heartworm in native foxes
R. Novak, J. Chestnut (UIUC), R. Warner (UIUC)

Applied ecology in the management of encephalitis in urban habitats
R. Novak, L. Kent (UIUC)

Evaluation of novel mosquito repellents
R. Novak, R. Lampman

St. Louis encephalitis virus surveillance and ecology
N. Krasavin, R. Novak

An integrated approach to managing malaria in Africa
R. Novak

West Nile Virus: potential host and vector interactions in Illinois
R. Novak, R. Lampman, J. Levengood, N. Krasavin

Training students in molecular techniques for Arbovirus detection
N. Krasavin, R. Novak

MEDICAL ENTOMOLOGY SELECT PUBLICATIONS

Dennett, J.A., R.L. Lampman, R.J. Novak, and M.V. Meisch. 2000. Evaluation of methylated soy oil and water-based formulations of *Bacillus thuringiensis var.israelensis* and Golden Bear Oil (R) (GB-1111) against *Anopheles quadrimaculatus*larvae in small rice plots. Journal of the American Mosquito Control Association 16(4):342-345.

Jensen, T., R. Lampman, M. Slamecka, and R. Novak. 2000. Field efficacy of commercial antimosquito products in Illinois. Journal of the American Mosquito Control Association 16(2):148-152.